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THREE NEW SPECIES OF THE GENUS *PSEUDOSTICHOPUS* FROM THE JAPANESE WATERS[1] (HOLOTHURIOIDEA: GEPHYROTHURIIDAE)

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With Text-figures 1–3 and Table 1

In examining the holothurians collected on October 27, 1976 from the 400–450 m deep floor around Shimo-Koshiki Island off the west coast of Kyushu Island, there were found two species of the genus *Pseudostichopus* Theel, 1876, that were clearly different from any of six species of this genus so far known from the Japanese Waters. In addition, five specimens of another form collected in 1972–73 from the 200–300 m floor off the coast of Akita Prefecture in the Japan Sea were submitted to the present auther by Dr. Saburo Nishimura for identification.

These species were compared carefully with 13 species of *Pseudostichopus* so far described. Then, it was found that they were seemingly distinct from any known species but representing new ones respectively. Generally in the species of this genus, however, the ambulacral appendages are so small that it is rather difficult to identify the pedicels and the papillae distinctively and to show correctly their arrangement and distribution. Further, the ossicles in various parts of holothurians will differ considerably in appearance and density with their growth and probably with some other factors. Therefore, the decisive identification might be better suspended till an eonugh number of specimens, showing the range of variation in respective aspects, are secured. On the other hand, from a practical point of view to promote the studies in the bathyal holothurians that are found only scarcely in the catches by trawl or dredge, it is urged to record them exactly. The present three species of *Pseudostichopus* from Japan are described below for this reason rather tentatively.

The position of this genus is based on Svend Heding (1940).

The auther wishes to express his hearty thanks to Dr. Takasi Tokioka and Dr. Suguru Ohta for reading the manuscript, also to Dr. S. Nishimura for important specimens.

Genus *Pseudostichopus* Theel, 1876

Appendages varies in size significantly; those of usual size along the ventro-

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lateral ambulacrum, while none or rudimentary ones along the mid-ventral ambulacrum. The pygal or vertical furrow is prominent. The body surface is coverd with various foreign materials such as spicules of glass sponges, foraminiferan shells, mud or sand etc..

Subgenus *Pseudostichopus*

The body is cylindrical. The ventro-lateral and other appendages are not or only slightly differentiated in seze. No ossicles are found either in the body wall or around the anus.

Pseudostichopus (*Pseudostichopus*) *dilatorbis* n. sp.

Japanese name: Oh-waraji

(Fig. 1, A)

Holotype: 119 mm long and 39 mm wide female; locality around Shimo-Koshiki Island off the west coast of Kyushu Island, 400–450 m deep, collected by Imaoka on October 27, 1976; deposited at the Seto Marine Biological Laboratory, SMBL Type-309.

Paratypes: Two other specimens; 167 mm long and 59 mm wide, and 205 mm long and 61 mm wide respectively; collected and deposited the same as the holotype, SMBL Type-310.

The largest specimen is about 205 mm and 61 mm in length and width respectively. In an optical section of the body, the dorsal side is somewhat arched curvine abruptly at the middle, while the ventral side is rather even; thus the section assumes roughly a triangle. The mouth is situated ventrally near the anterior end of the body. The anus is situated on the ventral side at the bottom of the prominent ventral furrow. The anal margin is plain. The tentacles are somewhat retracted, 20 in all, and are nearly of the same size; they are coloured grayish. Each tentacle is of the common shape of this genus, more or less shield shaped; no free tentacular ampulla is found.

The body surface except the tentacles is encrusted densely with sand, foraminiferan shells and spicules of glass sponges. In addition, in the largest specimen some bryogoans, brachiopods, gastropods, bivalves and an ascidian were found attached to the body surface. The tegument is whitish and opaque. Generally it is about 2 mm in thickness, and of a moderate hardness. There are faint swellings along the ventro-lateral ambulacrum. The ambulacral appendages are very minute, 1.9 mm long and 0.3 mm broad at the maximum and arranged in double rows along the mid-ventral and the dorsal ambulacrum, while irregularly in a single row along the ventro-lateral ambulacrum; they are 19 and 9 along the right inner and outer rows and 22 and 5 along the left inner and outer rows respectively along the dorsal ambulacrum, they are vestigially 4 and 3 along right and left rows respectively along the mid-ventral ambulacrum, in size the ventro-lateral appendages are not distin-

guished from the ones of the interambulacrum in the holotype. The appendages near the posterior end become larger with the body size. The interambulacral appendages are scattered on the body surface naerly evenly and also very small, larger on the dorsal and smaller than on the ventral ones, but generally less than 0.5 mm long and 0.2 mm broad. Differentiation into the pedicels and papillae could not be

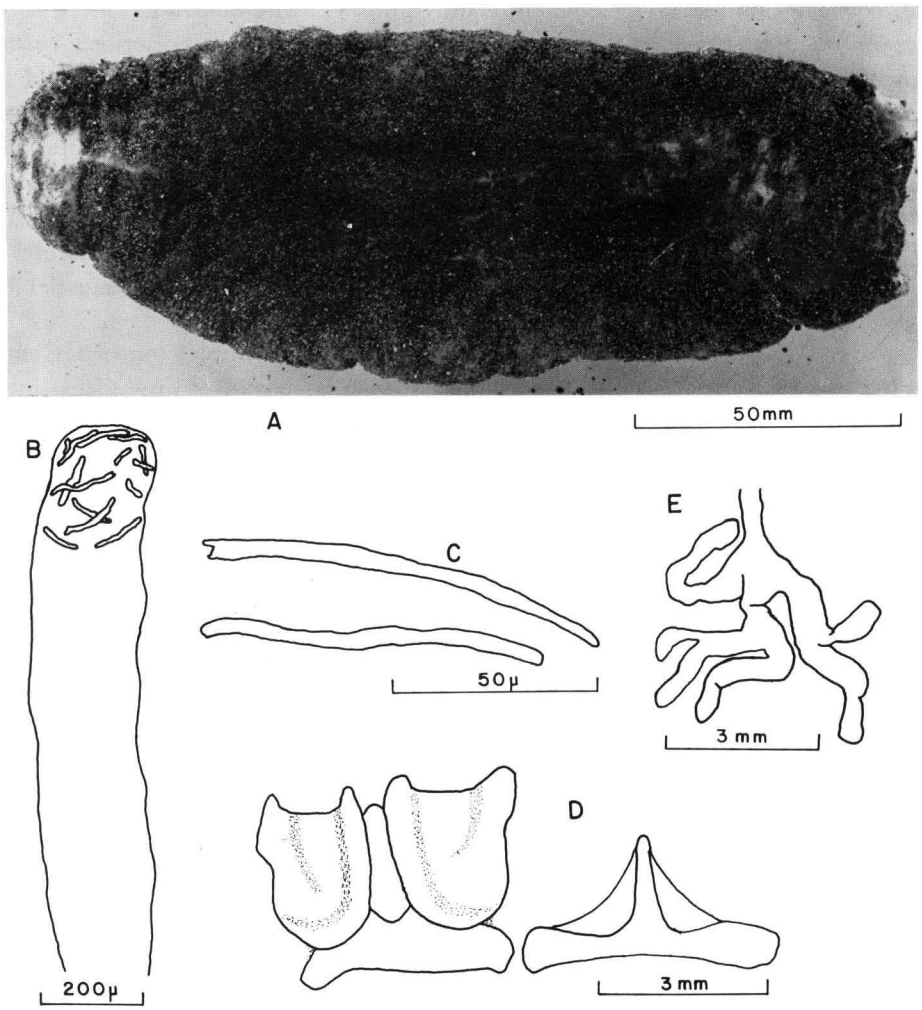

Fig. 1. *Pseudostichopus* (*Pseudostichopus*) *dilatorbis* n. sp. A: Dorsal view. B: Appendage showing the distribution of rods on it. C: Rods from an appendage. D: Calcareous ring. E: Branched genital tube.

confirmed in the present specimens; all the appendages are of a simple appearance, without any kind of terminal structure.

The ossicles can be found exclusively in the larger appendages near the posterior end (Fig. 1, B). Usually in the extremities of these appendages, there are found

the rods (Fig. 1, C) about 110 μ in length, slightly curved and faintly bifurcated at each end.

The calcareous ring (Fig. 1, D) is rather broad. The large radial piece consists seemingly of three parts, the median cuspid part and a pair of antero-lateral wings, the anterior edge of which is projected out of each ends, especially markedly at the inner corner; with a conspicuous notch at the posterior one-third on each lateral side; concavity on the posterior margin insignificant. The interradial piece is considerably narrow, provided with a prominent median dent and posteriorly concave slightly. A single Polian vesicle is present; it is about 12 mm long, curved and issued from the left vnetral part of the ring canal. As far as the present specimens were examined, no madreporic canal was detected. Two respiratory trees issued from a common base are extending anteriorly to the middle of the body, quite free from the plexus of pseudo-haemal vessels. Two branched genital tubes (Fig. 1, E) are present, one on each side of the dorsal mesentery. The gonads are mature, the eggs are 226–444 μ in diameter; 359 μ on an average. The longitudinal muscles form single bands.

Remarks: The calcareous ring of this new species resembles somewhat one of *P. aleutianus* Ohshima, but the present new species is devoid of any ossicle in the tentacles and the anal region. The ossicles in the large appendages of the anal region of this new species resemble somewhat those of *P. nudus* Ohshima, though the tentacles are devoid of any ossicle and the genital tubes are branched in the present new species.

Subgenus *Trachostichopus*

The body is slightly flattened. Appendages differ in size clearly between the ventro-lateral and other ambulacral rows. Ossicles are present around the anus and the body wall, especially around the gonopore.

Pseudostichopus (*Trachostichopus*) *tachimaruae* n. sp.

Japanese name: Chibi-waraji

(Fig. 2, A)

Holotype: 20 mm long and 8 mm wide male; locality around Shimo-Koshiki Island off the west coast of Kyushu Island, 400–450 m deep, collected by Imaoka on October 27, 1976; deposited at the Seto Marine Biological Laboratory, SMBL Type-311.

Paratypes: Two other specimens; 29 mm long and 13 mm wide, and 35 mm long and 13 mm wide respectively; collected and deposited the same as the holotype, SMBL Type-312.

The largest specimen is about 35 mm and 13 mm in length and width respectively. An optical section of the body is flattened as a whole, though the dorsal side is rather arched, while the ventral side is somewhat flattened. The mouth is situated ventrally, but slanting to the ventral surface at about 30°, near the anterior end of the body.

The anus is open on the ventral side at the bottom of the prominent vertical furrow. The natural appearance of the anal margin could not be confirmed as the margin had been more or less injured. The tentacles are entirely retracted, 19 in all and larger on the dorsal than of the ventral side; they are coloured whitish. Each tentacle is seemingly of the common shape in the genus, more or less shield shaped; no free tentacular ampulla is found.

The body surface except the tentacles is encrusted densely with sand, foraminiferan shells and especially with spicules of glass sponges. The tegument is slightly whitish but nearly transparent in alcohol. It is generally less than 1 mm in thickness, and of a moderate hardness. Any kinds of ridges or swellings are not formed on the body surface. The ambulacral appendages are very minute, about 1 mm long and 0.1–0.4 mm broad, and wholly indiscernible along the mid-ventral ambulacrum. The appendages are arranged in double rows along the dorsal ambulacrum, while in a

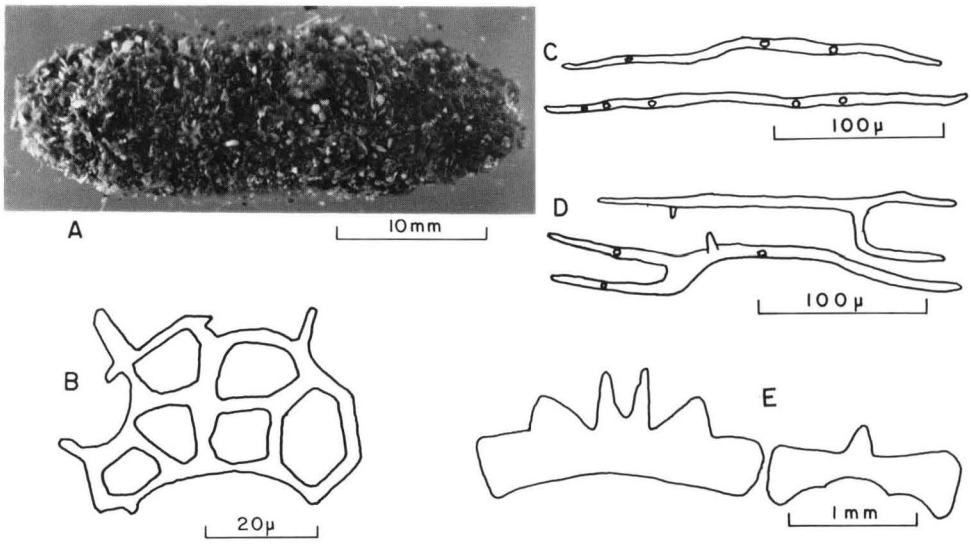

Fig. 2. *Pseudostichpous* (*Trachostichopus*) *tachimaruae* n. sp. A: Dorsal view. B: Perforated plate from around anus. C,D: Rods from a tentacle. E: Calcareous ring.

single row along the ventro-lateral ambulacrum. They are 35 and 11 along the right inner and outer rows and 31 and 13 along the left inner and outer rows respectively of the dorsal ambulacrum. Along the ventro-lateral ambulacrum, they are 57 and 53 on the right and left sides respectively. In every row, the appendages are crowded more densely near the posterior end. In size the difference between the dorsal ambulacral and ventro-lateral appendages is not clear. The interambulacral appendages, which are scattered on the body surface except the ventral surface, are also very small. Differentiation into the pedicels and papillae could not be confirmed in the present specimens; all the appendages were of a simple appearance without any kind of terminal structure.

The ossicles can be found exclusively around the anus and in the tentacles.

Only a few perforated plates are found in the tegument around the anus, they are about 55 μ in length and provided with 6 fenestra at the maximum, although these ossicles might be slightly injured (Fig. 2, B). The ossicles of the tentacles are found always paired when present, but wholly missing in some tentacles. Two kinds of them are distinguishable, the one (Fig. 2, C) is a simple rod with a few to several knobs, while the other (Fig. 2, D) is more or less forked at each end and further may be furnished in other parts with some minute projections; they are about 180–220 μ in length, 200 μ on an average.

The calcareous ring (Fig. 2, E) is rather narrow. The radial piece is provided on the anterior margin with a pair of smaller midian dents and two large lateral ones, and slightly and gently concave on the postrior margin. The interradial piece is a little narrower than the radial piece, provided with only a prominent median dent and concave more deeply in the posterior. A single Polian vesicle is present, about 2 mm long and roughly club-shaped with the distal end slightly swollen, and issued from the left ventral part of the ring canal. As far as the present specimens were concerned, no madreporic canal was detected. Two respiratory trees issued from a common base are extending anteriorly to the middle of the body and quite free from the plexus of pseudo-haemal vessels. Two unbranched genital tubes are present, one on each side of the dorsal mesentery. The gonads are marure in the holotype. The longitudinal muscles form single bands.

Remarks: The calcareous ring of this new species resembles somewhat one of *P. propinquus* Fisher, though in high the radial piece is much higher in this species than in the present new species. Further, the present new species is devoid of any ossicles in the ambulacral appendages and the genital tubes. In addition, the plates from the anal region and the rods from the tentacles of the present new species differ distinctly from those of any known species, that have the anal calcareous deposits, in their simplicity.

Pseudostichopus (*Trachostichopus*) *japonensis* n. sp.

Japanese name: Mukade-waraji

(Fig, 3, A)

Holotype: 35 mm male; locality the Japan Sea off the coast of Akita Prefecture, 200–300 m deep, collected by Dr. S. Nishimura in 1972–73; deposited at the Seto Marine Biological Laboratory, SMBL Type-313.

Paratypes: Four other specimens; 25, 34 36 and 37 mm long respectively, collected and deposited the same as the holotype, SMBL Type-314.

As these five specimens had been preserved in alcohol, the condition was rather good, though the external appearances were somewhat changed. The largest specimen is about 37 mm in length. The mouth is situated ventrally near the anterior end of the body. The anus is open at the bottom of the shallow vertical furrow. The original appearance of the anal margin could not be confirmed as the margin had

been more or less injured. The tentacles are entirely retracted, 20 in all and nearly the same in size; they are coloured grayish. Each tentacle is seemingly of the shape generally seen in the genus, more or less shield-shaped; no free tentacular ampulla is found.

The body surface except the tentacles is encrusted densely with spicules of glass sponges, especially with mud and shell fragments. The tegument is reddish gray in alcohol. It is generally less than 1 mm in thickness, and of a moderate hardness. Any kind of ridge or swelling is not formed on the body surface. The ambulacral appendages are very minute, about 1 mm long and 0.2 mm broad, and wholly indiscernible along the mid-ventral ambulacrum. The appendages are arranged in double rows along the dorsal ambulacra and the ventro-lateral ones. They are 21 and 23 along the inner and outer rows of right, similarly 22 and 25 in left dorsal ambulacrum respectively. They are 102 and 89 respectively along upper and lower rows

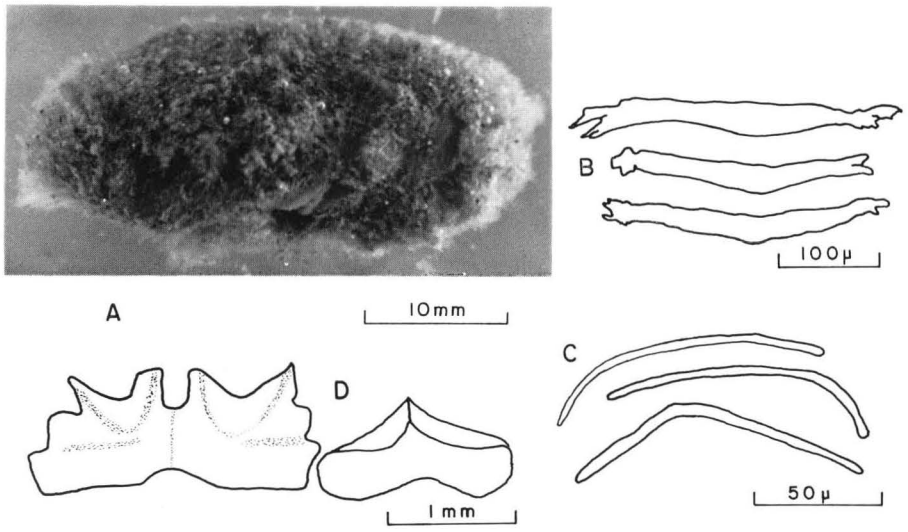

Fig. 3. *Pseudostichopus* (*Trachostichopus*) *japonensis* n. sp. A: Dorsal view. B: Rods from a tentacle. C: Rods from an appendage. D: Calcareous ring.

in right, similarly 106 and 90 in left ventro-lateral ambulacrum, they are larger than the dorsal ambulacral ones in size. The interambulacral appendages exist only as in the surroundings of the ventro-lateral ambulacra; they are nearly as large as the ventro-lateral ambulacral appendages. Differentiation into the pedicels and papillae could not be confirmed in the present specimens; all the appendages are of a simple appearance, without any kind of terminal structure.

The ossicles are confined to the tentacles, appendages, ventral tegument and around the anus. The ossicles of the tentacles (Fig. 3, B) are rather thick and nearly straight, showing faintly a sign of bifucation and furnished with some minute papillae around each end; they are about 200–400 μ in length, 300 μ on an average. While the rods (Fig. 3, C) found in the extremities of the dorsal appendages are thin, well

bent, and about 90–130 μ in length, 110 μ on an average. Furthermore, the rods found in the ventral tegument and around the anus are short, thick, and about 42–146 μ, 63 μ in length on an average.

The calcareous ring (Fig. 3, D) is of a moderate breadth. The radial piece is provided on the anterior margin with a pair of median stouter dents and two lateral weaker ones, and slightly concave around the middle of the posterior margin. The interradial piece is a little narrower than the radial, provided with only a prominent median dent and the postrior margin is concave slightly and gently. A single Polian vesicle is present; it is issued from the left ventral part of the ring canal. As far as the present specimens were dissected, no madreporic canal was detected. Two respitatory trees issued from a common base reach the anterior two-thirds of the body length, quite free from the plexus of pseudo-haemal vessels. Two unbranched genital tubes are present, one on each side of the dorsal mesentery. The gonads are mature. The longitudinal muscles form single bands.

Remarks: The existence of the ossicles in the extremities of the appendages of this new species may remind us them of *P. nudus* Ohshima, *P. unguiculatus* Ohshima, *P. molpadioides* Ohshima and *P. dilatorbis* n. sp., however, the present new species differs from *P. nudus*, *P. unguiculatus* and *P. molpadioides* in the shape of the calcareous ring and the rods of the appendages and tentacles, and from *P. dilatorbis* in the appearance of the genital tubes (unbranched in the former), the distribution of the appendages and the absence of the ossicles in the tentacles in the former. In the shape of the calcareous ring, this new species resembles somewhat *P. trachus* Sluiter described by Mitsukuri (1912) and Ohshima (1915, 1917). However, the real status of the specimens treated by these two authers seems rather questionable, present new species and those specimens may better be reserved till the further detailed check on them is finished.

This new species might be included among the subgenus *Pseudostichopus* as the ventro-lateral and other appendages are differentiated in size. However, the new species is furnished with the ossicles in the ventral tegument and around the anus, and this is evidently a very important character of the subgenus *Trachostichopus*, therefore, I want to treat here this new species under *Trachostichopus* provisionally.

The comparison between the present three new species and thirteen already known species which have been inlcuded by Heding (1940) in the genus *Pseudostichopus* is attempted as follows, as shown in next table.

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Table 1–1. Morphological features of so far known 16 species of *Pseudostichopus*, inclusive of the present new species.

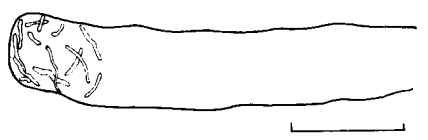
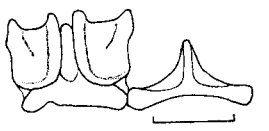
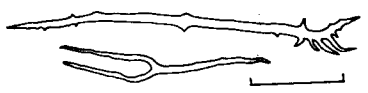
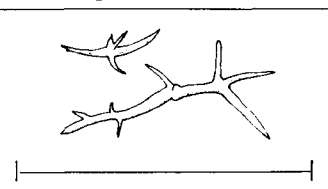
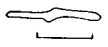
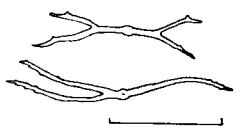
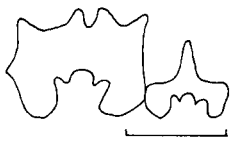
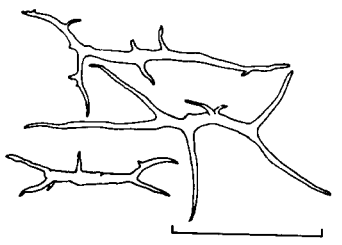
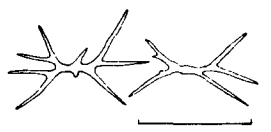
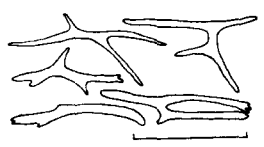
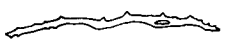
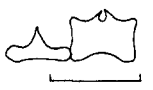
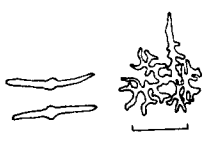
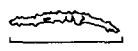
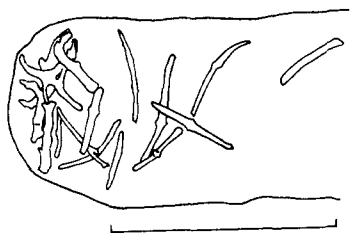
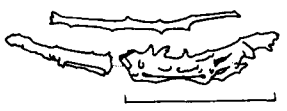
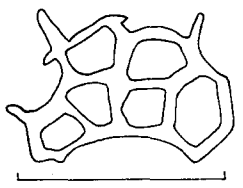
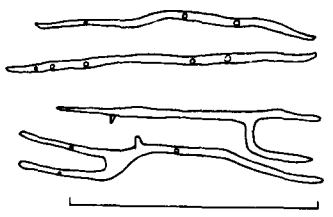
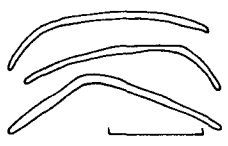
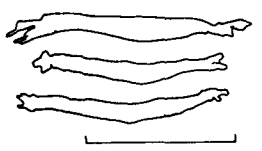
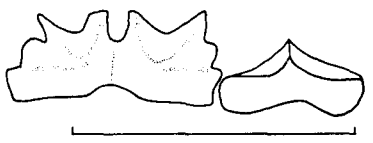
Species name (Sources)	Locality (Depth) Size	Appendages	Genital tubes — Respiratory trees	Anus	Tentacles	Calacreous ring
Pseudostichopus (*Pseudostichopus*) *lapidus* Herouard, 1923 (Herouard, 1923)	33°9′N 23°15′45″W; 33°8′N 23°18′45″W (4020 m) 15 mm	14 to 15 along dorsal and about 25 along ventro-lateral ambulacrum. 14 swellings along ventro-lateral.	Well developed. Ossicles absent. Ossicles absent.	On ventral side in vertical furrow.	Ossicles of various forms.	
P. (*P.*) *pustulosus* Sluiter, 1901 (Sluiter, 1901a) (Sluiter, 1901b)	0°54′S 128°39.3′E; 3°37.7′S 131°26.4′E (827 m, 924 m) 130 mm 67 mm	An irregular row along mid-ventral ambulacrum and 20 swellings along ventro-lateral. Ossicles present.	Branched. Well developed.	The same as above, but vertical furrow not deep.	20; ossicles of long and perforated plates.	Well but not strong developed. 
P. (*P.*) *globigerinae* Herouard, 1923 (Herouard, 1923)	46°17′N 5°42′W (4380 m) 30 mm	Many and well developed on body surface, except mid-ventral ambulacrum but around anus.	Well depeloped.	In deep vertical furrow.		Present.
P.(*P.*) *dilatorbis* n. sp.	Around Shimo-Koshiki Island west of Kyushu Island. (400–450 m) 59–205 mm	19 and 9 respectively along inner and outer rows in right, similarly 22 and 5 in left dorsal ambulacrum. Single irregular row along ventro-lateral ambulacrum. Rudimental 4 and 3 respectively along right and left row in mid-ventral ambulacrum. Interambulacral ones scattered on body surface.  Scale: 300 μ	Branched. Ossicles absent. Ossicles absent.	On ventral side at bottom of prominent vertical furrow, ossicles indiscernible.	20; ossicles absent.	 Scale: 3 mm
P.(*P.*) *mollis* Theel, 1876 (Theel, 1886)	50°56′S 74°14′W; 52°45′30″S 73°46′W; 46°48′S 37°49′E (250 m, 440 m, 90–126 m) 140 mm	Double narrow rows along dorsal ambulacrum. 2 to 5(?) rows of more crowded ones along ventro-lateral. Very rudimental along mid-ventral ambulacrum. Some fragements of ossicles in dorsal ped .	(Ludwig, 1894) Rather long, slender, unbranched.  Scale: 100 μ Well developed.	On ventral side at bottom of rather deep vertical furrow.	20.	 Scale: 3 mm
P. (*P.*) *marenzelleri* Herouard, 1923 (Herouard, 1902) (Herouard, 1923)	36°54′N 20°46′15″W; 36°54′N 20°51′45″W (4400 m) 110 mm	Many along dorsal ambulacrum. Many ones in rows at anterior and posterior extremities along each ventro-lateral ambulacrum. Found around mouth and in posterior one-third of ventral-surface, but rarely along mid-ventral ambulacrum.				
P.(*P.*) *unguiculatus* Ohshima, 1915 (Ohshima, 1915) (Ohshima, 1917)	32°34′N 132°41′45″E; 34° 4′20″N 137°57′30″E; 34°N 137°49′40″E (1058 m, 1142 m, 1680 m) 90 mm	About 25 along each of double dorsal rows. Single row along ventro-lateral ambulacrum. Irregularly along mid-ventral ambulacrum. 4 to 5 ones on conical warts along ventro-lateral. End plates (100 μ in diameter) present, but no rods in ventro-lateral tube feet; 80–100 μ long rods present in dorsal papillae.  Scale: 50 μ	Unbranched. Ossicles 80–200 μ long.  Scale: 100 μ	In center part at bottom of deep vertical furrow.	20. Rods 375 μ long.  Scale: 300 μ	 Scale: 3 mm
P. (*Trachostichopus*) *propinquus* Fisher, 1907 (Fisher, 1907)	Northeast approach to Pailolo Channel (520 m)	Numerous very inconspicuous slender ones in a single irregular row along ventro-lateral ambulacrum. A few, long and very slender papillae along dorsal ambulacrum, arranged in double rows in anterior portion.	Slenderly branched by about ten times.  Scale: 100 μ Irregulaly branched rods. 120 μ long.  Scale;: 100 μ	On more ventral side than dorsal side at bottom of prominent vertical furrow. Ossicles absent.	18 (to ?).	 Dorsal pieces  Ventral pieces
P. *profundi* Djakonov, 1952 (Djakonov, 1952)	Southeast off Kamchatka Peninsula (4100–4200 m) 16.2–55.6 mm	More crowded and larger at each a end of ventro-lateral ambulacrum. Very few along dorsal and mid-ventral ambulacrum. Ossicles much smaller in anterior than posterior along dorsal ambulacrum; wholly lacking in some ones. Pseudorods 90–180 μ long. 	Unbranched; rarely including small, short and flat rods. Rarely with small, short and flat rods.	On ventral side at bottom of vertical furrow. Rods 170 μ long. 	20. Pseudorods 200 μ long. 	Dorsal pieces differ from others. 

Table 1-2. Morphological features of so far known 16 species of *Pseudostichopus*, inclusive of the present new species.

Species name (Sources)	Locality (Depth) Size	Appendages	Genital tubes — Respiratory trees	Anus	Tentacles	Calcareous ring
P. (*T.*) *aleutianus* Ohshima, 1915 (Ohshima, 1915) (Ohshima, 1917)	54°20′30″N 179°9′36″E; 54°33′N 178°45′E (1398 m / 1019 m) 73 mm	A few tube feet along dorsal ambulacrum, in double rows along ventro-lateral ambulacrum. Very small along mid-ventral ambulacrum. End plate (80 μ in diameter) in large tube feet.	Unbranched. Ossicles 60–150 μ long.  Scale: 100 μ Well developed. Ossicles absent.	In center part at bottom of vertical furrow. Ossicles 80–200 μ long.  Scale: 100 μ	20.  Scale: 200 μ	 Scale: 3 mm
P. (*T.*) *molpadioides* Ohshima, 1915 (Ohshima, 1915) (Ohshima, 1917)	43°N 140°10′30″E (714 m) 52 mm	Very small along dorsal ambulacrum and in double rows along ventro-lateral ambulacrum. Small tube feet along mid-ventral and similar ones scattered on body surface. Supporting rods (50–120 μ in length) and end plate (90 μ in diameter) in large pedicels.  Scale: 50 μ	Unbranched. Ossicles absent. Ossicles absent.	At bottom of unclear vertical furrow. Ossieles 60–200 μ. Scale: 100 μ	20. Scale: 200 μ	 Scale: 3 mm
P. (*T.*) *arenosus* Ohshima, 1915 (Ohshima, 1915) (Ohshima, 1917)	31°31′N 129°25′30″E (781 m) 45 mm	In double rows along dorsal ambulacrum, many large pedicels along ventro-lateral ambualcrum, in indistinct row along mid-ventral ambulacrum. With end plate (90 μ in diameter) but without supporting rods in extermity of pedicels.  Scale: 50 μ	Unbranched. Ossicles absent. Ossicles absent.	At bottom of vertical furrow.  Scale: 100 μ	20; surface of rods plain in extremity.  Scale: 200 μ	 Scale: 3 mm
P. (*T.*) *trachus* Sluiter, 1901 (Sluiter, 1901a) (Sluiter, 1901b)	1°10.5′S 130°9′E; 8°50.2′S 127°2.2′E (798 m / 883 m) 180 mm 155 mm	A few ones along dorsal, in double rows along ventro-lateral, pedicels along mid-ventral ambulacrum.	Rarely branched in distal extremity. Ossicles absent. Well developed. Ossicles absent.	At bottom of prominent vertical furrow.	17–20?. 	
P. (*T.*) *nudus* Ohshima, 1915 (Ohshima, 1915) (Ohshima, 1617)	54°30′N 179°E; 33°25′20″N 135°36″20″E (447–1398 m / 531 m) 190 m	Double rows along dorsal ambulacrum, numerous ones in about 8? rows on ventral surface. With rods (up 150 μ in length) but without end plate at extremity of dorsal papillae.  Scale: 300 μ	Unbranched. Ossicles absent. Ossicles absent.	At bottom of prominent vertical furrow.	20.  Scale: 200 μ	Scale: 3 mm
P. (*T.*) *tachimaruae* n.sp.	Around Shimo-Koshiki Island west of Kyushu Island. (400–450 m) 13–35 mm	35 and 11 respectively along inner and outer rows in right, similarly 31 and 13 in left dorsal ambulacrum. 57 and 53 respectively along right and left rows in ventro-lateral ambulacrum. Interambulacral ones scattered on body surface, except ventral surface. Ossicles absent.	Unbranched. Ossicles absent. Well developed. Ossicles absent.	On ventral side at bottom of vertical furrow.  Scale: 50 μ	19; ossicles always paired when present, but wholly missing in some ones.  Scale: 200 μ	 Scale: 3 mm
P. (*T.*) *japonensis* n.sp.	Off coast of Akita Prefecture. (200–300 m) 25–37 mm	21 and 23 respectively along inner and outer rows in right, similarly 22 and 25 in left dorsal ambulacrum. 102 and 89 respectively along upper and lower in right, similarly 106 and 90 in left ventro-lateral ambulacrum. Interambulacral ones only along ventro-lateral ambulacrum. Rods at extremity of dorsal ones.  Scale: 50 μ	Umbranched. Ossicles absent. Well developed. Ossicles absent.	On ventral side at bottom of shallow pygal furrow, with short thick rods.	20.  Scale: 200 μ	 Scale: 3 mm